Territorial analysis: Resilience to climate change at a glance

ANGUILLA

KEY MESSAGES

Climate change risks

Increased hot season	Major hurricanes	Sea level rise	Warmer oceans	Increasing flash floods	Droughts

Temperatures will continue to rise. Further intensification of the hot season, high to extremely high heat impact potential by 2030, along with more frequent and more intense heat waves. The number of extreme heat events will increase roughly 15-fold by the 2020's and become a nearly year-long occurrence by the 2040s.

Major hurricanes: The frequency of category 4 and 5 hurricanes is expected to increase by 25%–30%. Storms are likely to become 2% to 11% stronger in terms of maximum wind speeds and possibly more frequent.

Continued sea level rise of 11 to 25cm. Rising sea levels combined with stronger winds during the strongest storms substantially increase the potential impact of storm surge and coastal inundation.

Warmer oceans along with steadily rising sea levels, even if global warming is halted in the foreseeable future.Trends in sea surface conditions include a projected rise of 0.77°C to 2.5°C by the end of the 21st century.

Rainfall: Changes in precipitation are more difficult to project; a slight decrease in total rainfall is anticipated, while single rain events will become more intense. Rainfall rates inside hurricanes could increase by up to 30%, increasing flash flood potential.

Droughts will become more prevalent. However, the trend may only become a major issue from the 2050s onwards.

Summary of key socio-economic indicators for Anguilla

Total Area (square km)	*91*
Population	*18,090*
Percent Urbanization	*10*
GDP per capita	*US$12,0200*
Debt as a percent of GDP	*20.1*
Unemployment Rate	*8*
Services as a percentage of GDP	*86*
Services as a percentage of workforce	*18*
Agriculture as a percentage of GDP	*3.0*
Agriculture as percentage of workforce	*74*
Percent Agriculture Land	*0*
Percent Forests	*61.1*
Human Development Index	*N/A*

Map of Anguilla

Figure 1: www.lonelyplanet.com

AFD Adapt'Action Expertise France
This technical assistance operation is financed by the French Development Agency (AFD) and implemented by Expertise France, within the framework of the Adapt'Action facility. This facility, which began in May 2017, supports African countries, LDCs and SIDs in implementing their commitments under the Paris climate agreement, through financing studies and activities on capacity-building and technical assistance, especially in the adaptation sector.

OVERVIEW

Anguilla is a British Overseas Territory in the **Leeward Islands** of the Lesser Antilles, comprising a small main island and several offshore islets. Anguilla is located at 18°12′ N Latitude and 63°03′ W and situated just 14 km north of St. Martin. It is one of the most northerly territories of the Leeward Islands. The nearly flat island measures 25 km by 5 km with a total land area of 91 sq. km. In 2012, Anguilla had a population of about 16,000 inhabitants.

The beaches are regarded as some of the best in the Caribbean, offering visitors several different experiences.

The island has a flat landscape so that spatial variation of rainfall is small and, since rainfall levels are usually low, vegetation is mainly small trees and bush.

As part of the northern Leeward Islands, Anguilla is well exposed to trade winds, which keeps temperatures moderate at around 27°C near sea level.

Based on data from surrounding countries in the Leeward Islands, the heat season (May to October) is characterized by around 36 hot days (when day-time high temperature are above 32°C) and 33 hot nights (with night-time lows above 26°C) on average, as well as, by several heat waves. During the cool season (December to March), heat levels are comfortable and around 31 cool nights (with lows below 22°C) occur on average.

The wet season spans May to November, largely coinciding with the Atlantic Hurricane Season. The mean annual rainfall total is just over 1050 mm.

Based on data from surrounding countries in the Leeward Islands, extreme rainfall has the potential to trigger flash floods once every 3 years in the period April to May and nearly once per year between August and November. By contrast, in smaller, relatively flat islands within the OECS region, spells of seven consecutive dry days occur throughout the year, peaking in frequency during January to May, potentially limiting rainfed crop growth to the wet season. Finally, impactful drought occurs roughly every 4-5 years during the dry season, and roughly every 10-12 years during the wet season, potentially impacting on freshwater availability.

ANGUILLA BEACH - *source: EbA-GESI Adapt'Action*

CLIMATE TRENDS AND PROJECTIONS

OECS, with CIMH, undertook an extensive analysis of the current trends and future projections of climate for the region was based on data from various meteorological services across the region, as well as future projections from regional circulation models (RCMs) developed by the Climate Studies Group of the University of the West Indies. In terms of priorities of relevance for the Leeward Islands, these climate trends and projections (across a range of emissions scenarios: a low (Representative Concentration Pathway 2.6 – RCP2.6), mid-range (RCP4.5) and high (RCP8.5)), (see details page 8) point to the following risks.

PROJECTED HEAT TRENDS

Figure 2 shows that the increase in frequency of hot days and nights in the Leeward Islands is further accelerated into the 2020s, when frequency is eight-fold, to end up close to a 100% of all days in the year in most years during the 2040s. However, given the recent observed increase rate appears to be somewhat slower for hot days and hot nights, one might expect a delay in reaching a near 100% frequency.

For **cool days and nights**, one can see that, from a 1961-1990 model baseline of 10% frequency, a decrease of over 75% was already noted by 1981-2010. This compares to observed decrease rate of over 60% for cool days and over 40% for cool nights.

Cool days and nights become virtually absent from the projected future as early as the 2020s.

Finally, looking at the number of days spent in **heat waves** of at least six consecutive days (the so-called warm spell duration index or WSDI), a remarkable increase is noted across all three scenarios, as well as, in the observations.

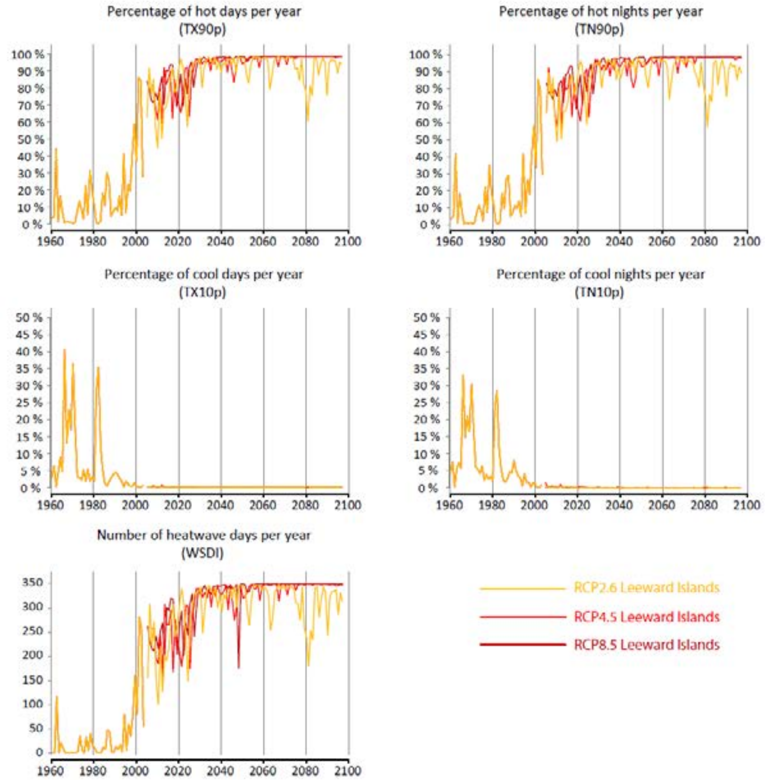

Figure 2

In the Leeward islands: Simulated annual trends in the percentage of hot days (TX90p, top left), hot nights (TN90p, top right), cool days (TX10p, middle left) and cool nights (TN10p, middle right) per year, as well as, trends in the annual number of heatwave days during long heat waves of at least six consecutive days (WSDI, bottom) from three downscaled projections.

Whereas the simulated baseline period only recorded 18 such heatwave days per year on average, the numbers had already increased fivefold by 1981-2010 to further increase roughly 15-fold by the 2020s and becoming a nearly yearlong occurrence by the 2040s.

It should be stressed that the strong simulated trends in the heat-related indices after around 1980 only corresponds well qualitatively with the strong observed trend. However, even with the downscaled projections overestimating the actual trends, hot days and hot nights will likely occur during most days of each year by mid-century, while cool days will likely disappear much sooner. Unfortunately, this committed future change seems to be mostly unavoidable, because the conclusion is valid no matter what RCP scenario is considered.

EXTREME RAINFALL

Projected Changes in Extreme rainfall

As can be seen from Figure 3, there are no clear signals in projected trends of extreme rainfall. Clearly, the year-to-year variability exceeds by far the long-term trend in both the proportion of annual rainfall totals from extremely wet days R95pTOT) and the number of days with heavy rainfall (R10mm). While the former appears to increase over time in all three scenarios, the R10mm decreases in both RCP4.5 and RCP8.5. However, if both trends do manifest, this means extreme rainfall will become less frequent, but even more intense. This means that the potential for flash flooding and related hazards may increase throughout the 21st Century, though changes may be hardly detectable by the 2020s and 2040s. An indication of such increasing flash flood potential towards 2100 comes from the fact that the RCP8.5 systematically projects fewer years with at least 5 days with heavy rainfall than RCP4.5 during the second half of the Century. The same is apparent when comparing RCP4.5 to RCP2.6. Indeed, the period 2050 to 2089 contains 19 years with at least 5 days with heavy rainfall in RCP2.6, versus 16 in RCP4.5 and only 10 in RCP8.5.

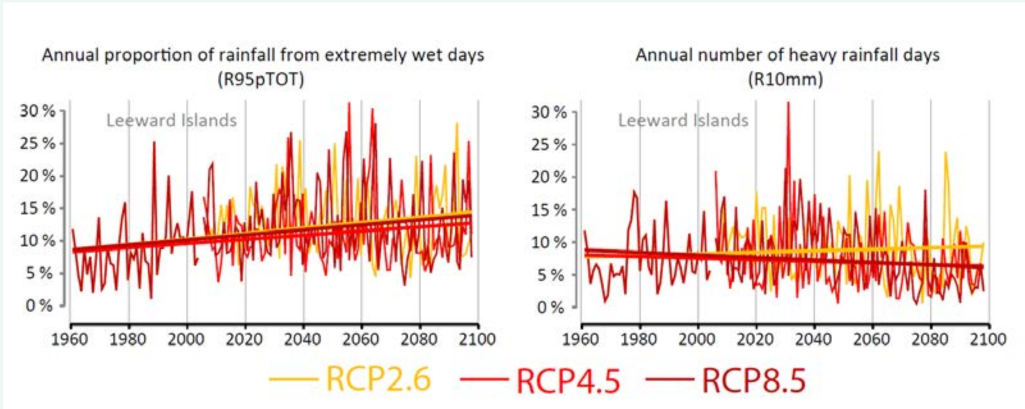

Figure 3

For the Leeward Islands: Simulated annual trends in the percentage of the rainfall total from extremely wet days (i.e. days with rainfall above the 95th percentile only (Rp95TOT, left), the number of days with heavy rainfall (i.e. with at least 10 mm of rainfall – R10mm, right). Also plotted are the simulated trends in the duration (in days) of the longest dry spell (CDD, bottom). The results are shown for the RCP2.6, RCP4.5 and RCP8.5 downscaled projections.

Notes: The absence of significant simulated trends in Rp95TOT and R10mm indicates that flash flood potential may not significantly change in future. Also plotted are the simulated trends in the duration (in days) of the longest dry spell (CDD, bottom). The results are shown for the RCP2.6, RCP4.5 and RCP8.5 downscaled projections. Data source: projections provided by the Climate Studies Group Mona of the University of the West Indies – Mona Campus, Jamaica

DROUGHT

Drought has been and will remain an integral part of climate in the OECS region. This hazard, while physically dependent on both rainfall and evapotranspiration rates, is of lesser concern in the wetter islands with complex topography than in drier, low topography areas of the OECS region. However, where water consumption is intense due to high population density or high consumption by the islands' industries, the sensitivity of the environment and society to drought is significant.

Rainfall-Based Drought Indices

Meteorological drought can be defined as a deficit of rainfall over a period of several weeks to years.

When drier than normal conditions are significant and extend long enough to reduce the amount of available soil moisture, this can lead to crop wilting. Such droughts are called agricultural drought. If drought extends long enough to affect streams, rivers and water reservoirs above and below ground, one can refer to such droughts as hydrological drought. With reduced freshwater availability during prolonged hydrological drought, other socio-economic sectors start being affected, e.g. firefighting, household water provision, construction, tourism, etc. Such drought may be referred to as socio-economic drought.

Typically, reduced soil moisture and reduced flow in streams and small rivers takes anywhere between several weeks and about 6 months of rainfall deficits – i.e. **short-term drought** – to manifest. After 6 months of significant meteorological drought, stream flow in larger rivers and water levels in large reservoirs becomes affected. Finally, after about 9 to 12 months of rainfall deficits – i.e. **long-term drought** –, water levels in the largest surface reservoirs and in aquifers tend to lower and stream flow in the largest rivers tends to decrease.

Hence, a proxy for the different types of drought should account for the different timescales involved. Furthermore, it should be scalable to the national context of water management. Its calculation should be possible given the climate record available within the territory.

One such proxy, recommended by the WMO is the Standardized Precipitation Index (SPI, McKee et al., 1993). The SPI is calculated as a normalized precipitation anomaly over 1 month to 48 months. Given that most droughts in the OECS are seasonal in nature, the most relevant indices are SPIs calculated over three-month (SPI-3), six-month (SPI-6) and twelve-month (SPI-12) periods. However, it is possible for rainfall deficits to exceed 12 months as was the case during the 2014 to 2016 Caribbean drought.

HEAT - AN UNDERESTIMATED HAZARD

Air temperature does not vary much between seasons and years in Anguilla. The heat – being moderated by a prevalent easterly breeze – **has historically** not been regarded as a major hazard but, at best, a discomfort at times. However, with rising temperatures year-round, a more pronounced heat season with more frequent and intense heatwaves are becoming a **new norm.** Heat discomfort and heat stress has started affecting society and the environment. Important impacts (supported by research findings from around the world, including tropical regions and, where r eferences are given, Caribbean countries):

Human health: increased heat-related **mortality and morbidity** (suspected, but not measured in the territory– note that heatwaves are the deadliest weather-related hazard), in particular in persons with lower fitness; increased apathy and aggression; accelerated proliferation of vector borne diseases such as Dengue, etc. (e.g. Lowe et al., 2018).

Education: children's **learning ability** significantly decreases with increased heat exposure.

Energy: increased cooling demand and reduced efficiency in energy production.

National productivity: loss of hundreds of **man hours.**

Environment: exacerbation of **drought**; facilitation of **wildfires**; stress on **animal populations.**

Food security: crop failure due to wilting; severe heat stress related mortality and **morbidity in livestock** (e.g. Lallo et al., 2018).

Finally, because freshwater availability from soils and surface reservoirs can be reduced due to enhanced evapotranspiration rates relative to rainfall, a similar index called the Standardized Precipitation Evapotranspiration Index (SPEI, Vicente-Serrano et al., 2010) can be especially useful in monitoring drought. The index is constructed in the same way as the SPI and can therefore be calculated over any relevant time period (e.g. SPEI-3, SPEI-6 and SPEI-12). However, it offers the advantage of calculating a balance between rainfall (i.e. local water input onto the surface) and evapotranspiration (i.e. local water output from the surface).

Projected Changes in Drought

Projected trends in drought are shown in Figure 4 for RCP4.5 and RCP8.5) from 2020 to 2090. Aside from a marked increase in heat exposure, the future projections also indicate that **drought will become more prevalent.** However, the trend may only clearly manifest from the 2050s onwards.

An SPI value of around 0 is expected on average if rainfall totals are not changing from the 1961-1990 model climatology. However, in the RCP4.5 projection the SPI-6 shifts from close to 0 in the 2020s and 2030s to -0.6 and the SPI-12 from 0 to -1.4 – the latter value falling in the very dry category – in the 2070s and 2080s. Over the same periods in RCP8.5, the SPI-6 shifts from near 0 to -0.8 – moderately dry – and the SPI-12 from near 0 to -1.8, or **extremely dry on average** in the 2070s and 2080s. Those significant trends stand out even with the large interannual variability in both the SPI-6 and SPI-12.

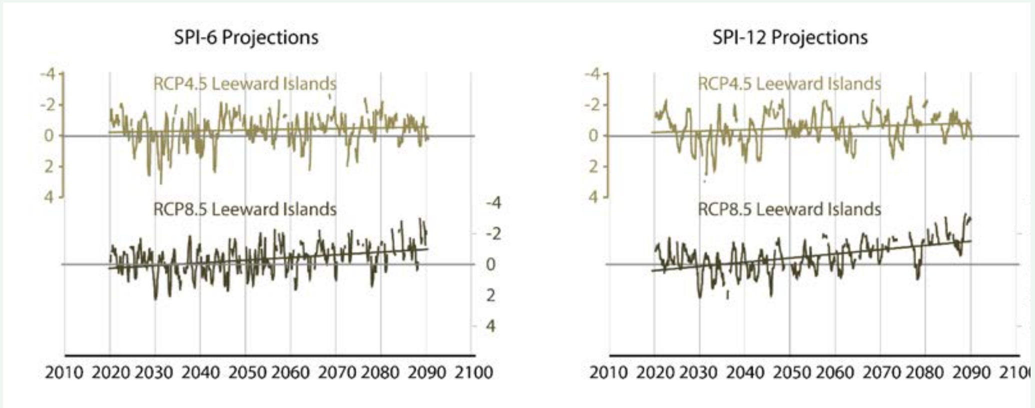

Figure 4

For the Leeward Islands: Simulated trends in the standardized precipitation index over six months (SPI-6, left) and twelve months (SPI-12, right) per year from the RCP4.5 and RCP8.5 downscaled projections.

Data source: projections provided by the Climate Studies Group Mona of the University of the West Indies – Mona Campus, Jamaica

EXTREME WET SPELLS - A PROXY FOR FLASH FLOOD POTENTIAL

Flash floods occur when the rainfall accumulation rate exceeds the rate of soil infiltration and surface drainage. There are rainfall thresholds beyond which the occurrence of wet spells correlates well with the occurrence of flash flood across much of the Caribbean. Caribbean-wide, such **extreme wet spells** are defined as a three-day period during which the rainfall totals are among the top 1% (i.e. exceed the 99th percentile) of all three-day rainfall totals in the historical record at a weather station (CSGM and CIMH, 2020).

While the flood record is incomplete and the number of recorded floods too low for robust statistical analysis, the use of extreme wet spell occurrence as a proxy for flash flood potential is validated regionally by similar findings in countries with a much larger sample of floods.

FUTURE CLIMATE PROJECTIONS - THE USE OF SCENARIOS AND CLIMATE MODELS

The most widely used tools to assess and simulate future or projected climates are **Global Climate Models** (GCMs, in academic circles referred to as General Circulation Models or Earth System Models). Such models can simulate to a great level of detail and reasonable accuracy how climate would behave around the world provided a scenario of socio-economic evolution or external physical factors would affect the energy balance of the earth's climate system. Three commonly used scenarios are the **RCP2.6** (a scenario based on a low carbon emissions future), **RCP4.5** (medium level of emissions) and **RCP8.5** (high emissions), elaborated by the Intergovernmental Panel on Climate Change (IPCC).

The major advantage of GCMs for the purpose of assessing how climate may change through time in future, is that they provide a **full spatio-temporal coverage** of earth's atmosphere. However, for the purposes of small island states in the OECS region, the spatial resolution is **far too coarse** to allow rigorous sub-regional analysis of future heat, drought and climate extremes. Island sub-regions such as the OECS are better served by **Regional Climate Models** (RCMs), which offer finer spatial resolutions. Among the CMIP-5 generation of projections run by a multitude of different GCMs and used in the IPCC's Fifth Assessment Report and many studies thereafter is the HadGEM2 GCM. To enable sub-regional analysis of trends in extremes, downscaled simulations can be performed using the **PRECIS regional climate** model.

Climate change may put pressures on our societies and environments by shifting them closer to or beyond the thresholds of their coping ranges. Therefore, climate projections are conceived to help provide the **scientific evidence base** for societies to adapt to climate change in future and hence build climate resilience for future generations. Such projections provide necessary insight to support **long term planning** for infrastructure, societal activities and the protection of environmental resources. In this climate profile, a special emphasis will be placed on two-time horizons: a **short-term horizon**, namely the 2020s (relevant within the current political context), and a **mid-term horizon**, namely the 2040s, relevant for infrastructure planning and many other societal and environmental systems.

SOCIOECONOMIC CHARACTERISTICS

Population

In 2011, Anguilla had a population of 13,572 persons, of that 6,707 (49.4%) were males and 6,865 (50.6%) females giving a male-to-female ratio of 1:1.02 (PAHO, 2017). See Table 1 below.

Main Economic Drivers

The main contributors to Anguilla's economy are Tourism and Construction, supplemented by financial services, agriculture and fishing as shown from Table 2 Just over thirty-four percent (34.2%) of females, compared to 18.8% of males, are non-participants in the labour force.

Tourism

Anguilla is heavily dependent on luxury tourism, which is the mainstay of the economy. The closure of the hotels due to Hurricane Irma, has had a "negative multiplier" effect on the economy (GOA, 2017). In 2019, the direct contribution of Travel & Tourism to GDP was EC$388.4 million (USD143.9 million) accounting for 51.3% of total employment (WTTC, 2020). Sixty-two percent of the arrivals were from the United States. The Government of Anguilla developed and implemented a Sustainable Tourism Master Plan (STMP) to 'provide the policy framework for development, management, monitoring and long-term sustainability of the tourism sector for a ten-year period (2010-2020). At the time of the completion of the plan, for the sector as a whole, the female/male gender balance was 60:40.

Energy

Anguilla is almost entirely dependent on imported fossil fuels (more than 99% of the island's electricity is generated using heavy fuel oil), leaving it vulnerable to global oil price fluctuations that directly impact the cost of electricity. Anguilla Electricity Company Limited (ANGLEC) is an investor-owned electric utility with an exclusive license to produce, transmit, and distribute electricity in Anguilla. ANGLEC has an installed generation capacity of 33 megawatts (MW), a total annual consumption of

Table 1

Population Distribution between Districts, 2011

(Government of Anguilla, 2011)

District	Population
West End	884
South Hill	1689
Blowing Point	825
Sandy Ground	252
North Hill	444
George Hill	1124
The Valley	1298
North Side	1514
The Quarter	1079
Stoney Ground	1577
The Farrington	629
Sandy Hill	633
East End	661
Island Harbour	963
Total	**13,572**

88.56 gigawatt-hours (GWh), peak demand of 13.99 MW, and 9.78% transmission and distribution losses, which translates to 8.57 GWh. Anguilla's government has developed an internal infrastructure to ensure integration of renewable energy technologies into the island's electricity system by establishing the Anguilla National Energy Committee and the Anguilla Renewable Energy Office. These institutions have been instrumental in the development of the country's 2011 Climate Change Plan (CCP) and 2008 National Energy Policy (NEP). Currently, the energy laws in Anguilla allow independent power producers to generate electricity using renewable resources for personal consumption or to supply the utility (NREL, 2015).

Transport

Cars are the main means of transport, and there is no public transport, such as buses or vans, since there isn't enough need. Because of the territory's small land mass and flatter terrain, bicycles, mopeds, motorcycles and walking are also popular means of getting around. Ferries offer transport from Anguilla to other islands. Pre-Irma, aside from golf 46 buggies used on various resorts, there was no form of electric transport, and, indeed, no form of public transport on island. The NEP (2008) sought to reduce dependence on fossil fuels for power generation and transportation by promoting through fiscal incentives a transition in the transport sector from fossil fuel powered vehicles to those that are powered by the use of hybrid, electric and hydrogen technologies. The island has one small international airport at which only certain private jets of specific sizes may land.

Land use

Several sources confirm that there is no large-scale agriculture, hence the assignment of agricultural land is 0% (2016 est.). Similarly:

- arable land: 0% (2016 est.) / permanent crops: 0% (2016 est.) / permanent pasture: 0% (2016 est.)
- forest: 61.1% (2016 est.)
- other: 38.9% (2016 est.)

Table 2

Anguilla GDP in 2007 by Economic Activity
(Caribbean Development Bank, 2016)

Economic Activity	EC$M
Hotels and Restaurants	184.79
Construction	151.67
Real Estate, Renting and Business Activities	92.98
Electricity and Water	28.99
Financial Intermediation	66.58
Other Community Services	17.86
Fishing	13.81
Transport and Communications	84.04
Public Administration and Defense	55.28
Wholesale and Retail Trade	61.6
Mining and Quarrying	12.50
Manufacturing	23.36
Education	14.30
Health	15.27
Agriculture, Livestock and Forestry	2.1

However, recently there have been public/private sector discussions in Anguilla, centred on "Building Effective Governance for Land Use Planning and Environmental Management Practices in Anguilla," involving various stakeholders. The project is now being continued, by the current Government of Anguilla, to develop an integrated system of legislation and regulations. Together, these measures will provide the legal and administrative framework for effective and coordinated land use planning and environmental conservation, protection and management in Anguilla.

Agriculture

Anguilla has unique agricultural heritage that is practiced by an increasing number of islanders on a part time basis, but has no farming industry. There is a shortage of farmland due to degraded and infertile soils, caused in part by previous soil mismanagement. This puts constraints on agriculture and food security. Few persons are engaged in hydroponics

Health

Health care is the responsibility of the Ministry of Health and Social Development. Anguilla has one polyclinic; four health centres, and a public Hospital, called Princess Alexandra, which is the only admitting facility (PAHO, 2017). There are also four private health facilities that provide a range of non-emergency services. Anguillans must travel overseas in order to access tertiary care services since these are not available on the island. The government covers these costs in many cases through the Ministry of Social Development's Medical Treatment Overseas Program, which has become an unsustainable financial burden to Anguilla. In 2015, almost US$ 1 million was spent on overseas medical treatment of 49 persons, 25% of whom were trauma cases (PAHO, 2017). The national public health laboratory, located at the hospital, is also operated by the HAA. Laboratory services are largely dependent on the sub regional laboratory at the Caribbean Public Health Agency (CARPHA) in Trinidad and Tobago.

VULNERABILITY OF SECTORS AND TERRITORIES TO CLIMATE RISKS

WATER RESOURCES

The trend indicating a decrease in the extents of water-related ecosystems is observable in many OECS member states that report information on SDG 6 achievements. Most the islands however are not under critical water stress, although the current situation can change drastically with the impacts of climate change mainly affecting water resources. There is still a lack of information concerning the impacts of climate change on water resources in OECS member states, as well as on the identification of possible conflicts of use that may occur in the future if climate change further affects water resource systems resulting in increased scarcity. Nevertheless, some of the eastern Caribbean islands are already water-stressed for at least part of the year. Some of them currently rely heavily on desalinization or unsustainable abstraction of groundwater resources, especially to serve the tourism industry. Changes in temperature, rainfall and extreme events will inevitably lead to reductions in water availability and quality, as a result both of damage to service infrastructure and reduced water quality through siltation of streams and rivers via landslides and destructive floods.

AGRICULTURE AND FOOD SECURITY

Agriculture is a critical sector in the economies and livelihoods of many of the countries in the Eastern Caribbean, although the region still relies heavily on food imports to meet local needs, at a significant cost. The sector comprises primarily rain-fed, small-scale subsistence farms growing multiple crops such as yams, sweet potatoes, and various vegetables such as peppers. There are also some large commercial farms focused on export crops such as banana and plantain, coconut, citrus, mango, and avocado. Speciality crops such as nutmeg, cinnamon, ginger and cloves are also important export earners for some islands such as Grenada. Other important grown crops are tropical fruit, coconut, cocoa, vegetables, herbs, tree crops and cut flowers.

Livestock production, likewise, is a basic source of food security for local populations in the Caribbean. Cattle, pigs, chickens, and goats are widely produced across the region, as are dairy foods. The sector is integral to rural livelihoods, providing food, materials, income and mechanical power for pulling carts and ploughing fields. Most of the livestock production follows a similar dynamic to that of agriculture, with small-scale subsistence and commercial producers catering primarily to a domestic market. However, recent efforts to diversify the agricultural industry in response to climate change and global markets have supported livestock exports.

Fisheries will be severely impacted by climate variability and change, as the associated impacts of rising seas and extreme weather events alter the productivity of aquatic habitats and the distribution and productivity of marine fish species. These changes are threat multipliers to existing stressors on the sector, including overfishing, loss of habitat, pollution, coral bleaching, and the proliferation of invasive species.

HEALTH

Extreme weather, coupled with higher temperatures and changes in rainfall, will impact the region's population both directly and indirectly. Heat stress, for example, induces dehydration and has been linked to chronic kidney disease in agricultural and construction workers, and has the potential to increase respiratory and cardiovascular disease risks. Storms and hurricanes can cause death and lead to flooding with significant other effects on crop production, water quality and water-borne illnesses. Additionally, the increased morbidity and mortality of water borne illnesses, as well as mental health effects of extreme events, along with impacts on cardiovascular and respiratory conditions are all subject to climate stress. Moreover, the region's aging population is vulnerable to increased heat stress. Disease outbreaks closely associated with the climatic conditions of the Eastern Caribbean include those transmitted by certain mosquito species. Temperature is an important determinant of biting rate and mosquito development. Precipitation provides habitats for the aquatic stages of the mosquito life cycle and strongly influences vector distribution. Changes in climate are already altering the spatial and temporal dynamics of dengue ecology, potentially increasing vector ranges, lengthening the duration of vector activity, and increasing the mosquito's infectious period. Other climate-related public health issues include harmful sargassum algal blooms and Sahara dust which could have serious implications for human health.

IMPACTS OF RAPID ONSET EXTREME EVENTS

Most of the Eastern Caribbean is made up of small island developing states. When an extreme event happens, it is therefore likely to overwhelm an entire country or territory because of its small size and have an outsize impact on national GDP. Emergency services are likely to be overwhelmed, while critical infrastructure serving the entire country may be significantly damaged or destroyed. The devastation is likely to be debilitating without outside support to address the immediate needs of the population. Figures 5 and 6 shows the Number of People Affected by Key Natural Hazards (Source: World Bank Climate Change Portal) and the Frequency distribution of natural hazards.

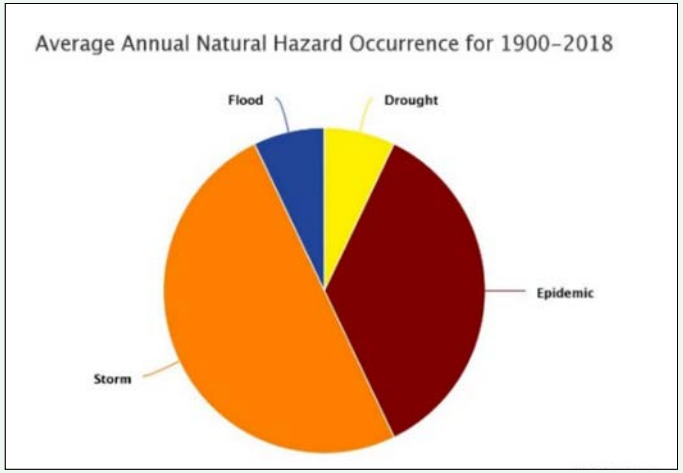

Figure 6

Frequency distribution of natural hazards between 1900-2018 in Anguilla

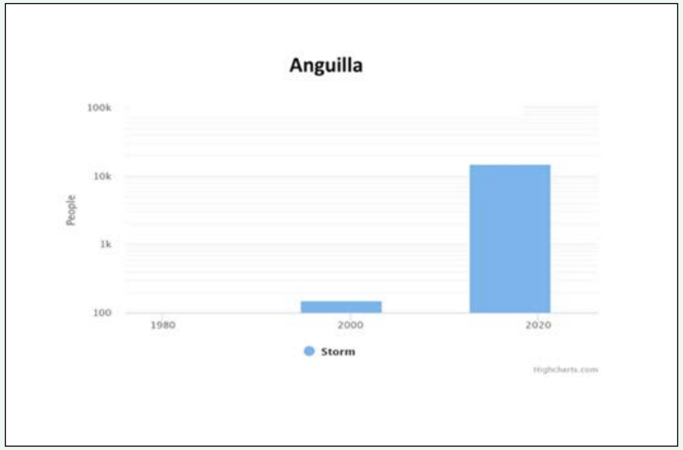

Figure 7

Number of people affected by key natural hazards 1985-2018 in Anguilla

Gaps in research and information

Although significant progress has been made to capture the available historical records of climate and hazards, there are still large variations in the needs and quality of research, information, and data in Anguilla.

Research gaps

- Analyses allowing a robust description of the climatology, variability, extremes and trends at any location is possible if long, good quality data records of (sub-)daily weather observations are available. This was not the case for Anguilla, hence leading the analysis to resort to proxies from weather stations in surrounding countries in the Leeward Islands.
- Some knowledge has been gathered since the 1990s on drivers of drought, excessive rainfall and tropical cyclones in the Caribbean as a whole. However, little information is available on the drivers of heat, extreme rainfall, sea level rise at the OECS regional level, let alone the Anguilla territorial level.
- Knowledge on the impacts of and risk associated with hurricanes, sea level rise and rising ocean temperatures engendering coral reef bleaching in the Caribbean is relatively well established. In addition, recent efforts have led to some advancement in mapping flash flood/flooding and drought as hazards and risk factors to socio-economic sectors in the Caribbean and, by extension, Anguilla. However, not much is known or measured with respect to heat impacts on Anguillan society and environment.

Data and information gaps

- A thorough knowledge of the climatology and trends, as well as, the drivers of hazard-triggering extremes within a territory depends first and foremost on the availability of long, good quality data records of (sub-)daily weather observations. With only one monthly rainfall record from the Clayton J. Lloyd International Airport station, research into climate-related hazard impact potential is challenging at this time and will remain so until a sufficiently long daily record becomes available.
- The Clayton J. Lloyd Airport station record of monthly rainfall totals spanning 26 years in length makes the climatological analysis hardly robust for an assessment of average monthly rainfall seasonality. However, without daily data, only the drought hazard can be assessed to some extent, though a longer record is needed to produce robust results.
- Much more so than weather observations, socio-economic and environmental impact data with respect to climate-related hazards beyond tropical cyclones and sea level rise are scant in the Caribbean, let alone Anguilla. This is particularly the case for heat impacts. Apart from sea level rise, heat is the one hazard that has already intensified and of which we are most confident it will continue to intensify. Therefore, in future, heat impacts on public health, agriculture, water, education, energy and labour need to be observed, archived and data sets made available for research, to determine the different dimensions of risk from excessive heat exposure.

CLIMATE CHANGE POLICY PRIORITIES IN TERMS OF ADAPTATION

Anguilla is a self-governing Overseas Territory of the United Kingdom. Its politics take place in a framework of a parliamentary representative democratic dependency, with the Premier is the head of government, and a multi-party system. Anguilla is an Associate Members of the OECS. Anguilla, as a UK OT, is not submitting to national communications to the UNFCCC nor a Nationally Determined Contribution (NDC) for the implementation of the Paris Agreement.

The Government of Anguilla adopted the **National Environmental Management Strategy and Action Plan** (NEMS) in 2001 revised in 2005, a requirement of the Government in discharge of its obligations under the St George's Declaration (SGD) of Principles for Environmental Sustainability in the OECS.
The NEMS includes in particular: Principle 8 to "**Address the Causes and Impacts of Climate Change**" establishing that the Department of the Environment shall develop a 'Strategy 25: Establish appropriate and relevant integrated strategies, plans and policies to adapt and respond adequately and in timely fashion to the causes and impacts of climate change' and Principle 9 to **Minimize and Manage the Causes and Impacts of Disasters; it its implementation strategy the NEMS refers to** the context of the government's obligation under the SGD and other international agreements.

Relevant Programmes / Projects

SELECTED PROGRAMME / PROJECT	VALUE (USD)	DONOR	YEAR	IMPLEMENTING AGENCY
Climate change adaptation in the fisheries sector of Anguilla and Montserrat.	£367,110	UK Government - The Darwin Plus: Overseas Territories Environment and Climate Fund under the Darwin Initiative	2017-2020	Caribbean Natural Resources Institute (CANARI), Ocean Resources Unit and the Centre for Resource Management and Environmental Studies of the University of the West Indies
Enhancing Capacity for Adaptation to Climate Change (ECACC) in the UK Caribbean Overseas Territories Project (Regional project).	N.A.	UK Department for International Development (DFID)	2007-2011	Caribbean Community Climate Change Centre

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